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A

DESCRIPTIVE ACCOUNT

OF THE

PALO DE VACA.

THE
PALO DE VACA
OR
COW TREE!

From an Original Sketch by Sir R. K Porter

P.H. Skelton's Lith: Southampton.

A

DESCRIPTIVE ACCOUNT

OF THE

PALO DE VACA,

OR

COW-TREE OF THE CARACAS.

WITH A CHEMICAL ANALYSIS

OF THE

MILK AND BARK.

"And out of the ground made the LORD GOD to grow every tree that is pleasant to the eye and good for food."

By JOHN MURRAY, F.S.A., F.L.S., &c.

LONDON:
EFFINGHAM WILSON, ROYAL EXCHANGE.

1837.

24691

PRINTED BY T. H. SKELTON, SOUTHAMPTON.

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TO

SIR ROBERT KER PORTER,

H. B. M's. CHARGE D'AFFAIRES, AND BRITISH CONSUL-GENERAL, &c., &c.,

CARACAS.

Dear Sir Robert,

It is with great propriety that I inscribe this brochure and monograph to you. Your courtesy and kindness supplied the *materiel;* and the chemical examination of the milk and bark alone are mine. It therefore, now, only remains for me to record my very great obligations; and

Believe me to be,

Dear Sir Robert,

Your's respectfully and obediently,

J. MURRAY.

Hull, 1*st October*, 1837.

DESCRIPTION OF THE PLATE.

The 'Palo de Vaca,' or 'Cow Tree,' lithographed from a sketch made by Sir Robert Ker Porter, on the spot, 23rd May, 1837.

The *Palo de Vaca* represented, grows in the mountain forests near Coriacca, in Venezuela. The size of the figures shews the height of the tree.

An endeavour has been made to preserve, as far as possible, a *fac simile* of the interesting drawing.

A

DESCRIPTIVE ACCOUNT

OF THE

PALO DE VACA.

THERE is no department of Natural History more fraught with rich and luxuriant proofs of design than the physiology of plants, nor are the exuberant bounties of a beneficent Providence any where more amply manifested. The Palms, for instance, supply almost all the requisites of nomadic life: "corn, wine, and oil," are expressive of the sustenance of our species; and Palms yield *sago, milk, wine, wax,* and *oil,* besides *cordage, culinary vessels, caps,* and suits of *raiment.* Their leaves form a shade from the vertical rays of the sun, and a shelter from the early and latter rains, as well as a roof for the wig-wam; not to enter into the detail of a long list of all that is necessary to the tenants of the tropics. It is, indeed, more especially in equatorial regions that we are most sensibly impressed with the Creator's bounty to his creatures, and the fuller emphasis of the gift recorded in the expressive language of the sacred records: "I have given you every herb bearing seed which is upon the face of all the earth, and every tree, in which is the fruit of a tree yielding seed, to you it shall be for meat."

What could the islander of the Pacific do without his *taro* and the *bread-fruit tree*—to him indeed the "stay of bread" and "staff of life;" and how could millions more, both in the old and new world, subsist, without the "Sago Palm," the "Jaca," the "Plantain," and "Bannana;" and what could the Arab do without the Date? Numbers in the peninsula of India still "cast their bread upon the waters, that they may find it after

many days,"* as in the times of old, while the Arab even now collects *manna* in the desert, to eat with his "unleavened bread." Not to mention the ministrations of vegetation to the refinements of luxury, "myrrh, frankincence, and all the powders of the merchant," the arts and manufactures in countless forms, and every varied section of social and civil life, are abundantly enriched from a cornucopia ever full and flowing.

The *Rubus arcticus*, in Lapland; the *Peganum retusum*, of the peninsula of Sinai; the "Water Melon," of the Desert of Ajmere; and the Palo de Vaca, of the rocky flanks of the Cordilleras,—all prove that Providence has no where "left himself without a witness."

The surface of the Wax Palm yields abundant wax for light: then there is the "Shea," or Butter Tree, and others yield tallow, while the *Sapindus*, or Soap-berry, is an excellent substitute for *soap*, and I have used it as such. The seed vessel of the *Lycythis ollaris*, or Pot-tree, is of adamantine hardness, and becomes an admirable culinary vessel, which resists the fire. The *Spathe*, or hood of a Palm, and the *tomentum* of the leaves of the *Hermas depauperata* supply caps, and gloves, and stockings; and the beautiful and rich veins of these leaves impart a singular elegance to the latter. The "Shirt-trees," of the Cerra Duida, as described by one of the most accomplished of travellers, will be remembered, and the inner bark, *liber*, of the "Paper Mulberry," or the "Natoo," of the Tonga Islands, supplies the natives of Polynesia with a beautiful material for dress, while the *Daphne lagetto*, of Jamaica, yields an elegant aud ornamental veil, which outstrips the genius of art and its refinements.

The "bush rope," of the American Continent, is a natural rope of great strength and power, and the elastic fibres of the Cocoa-nut defy the hurricane of the west, as well as the monsoon of the eastern hemisphere;† while the hollow stem of the *Cecropia peltata* forms a trumpet that resounds through the forest, and awakens the echoes from their slumbers. Thus the useful and the ornamental have been consulted. There is "a feast in the wilderness," and living "streams in the desert," and all are benefited and blessed. Whatever sentiments of pain and pity are excited by reflecting on the poison trees of Java, the poisonous root of the *Aconitum ferox*, the *Upas tieute and Upas antiar*, or the still more formidable *Tanghinia veneniflua* of Madagascar, and the savage applications of these lethal juices by the natives, "our spirits are refreshed, and we get

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* I am of opinion that this is beautifully illustrated in the mode of sowing the seeds of the *Lotus*, as described by Mr. Royle, in his "Flora of Cashemire, &c."

† Now made into elegant mats, &c.

well again," when we turn to the "Palo de Vaca," and our contemplations are fixed on the Cow Tree and its nutritious, bland, and refreshing streams. Among the magnificent spectacles of tropical forests, and their glorious architecture, there is none, methinks, that so rivets to the hallowed spot our feelings and sympathies as the wonderful "Cow Tree." The excellencies of the sublime and beautiful here mingle together; and there being not only "what is beautiful to the eye but good for food," the sentiment of gratitude mingles in the affections, and gives a new pulse to "the genial current of the soul." "Absit invidia" I would wish to say, but I must needs confess that I envy the happy feelings of the Baron de Humbolt and Sir R. K. Porter, at the sight of this magnificent tribute of creative good. Dr. Wallick, in genuine enthusiasm, "leaped for joy," at the spectacle of the *Amhertia nobilis*, with its vermilion canopy of dazzling blossoms; Sir Stamford Raffles stood astonished when he contemplated the flower of Sumatra, that bears his name, and displays a disc of nine feet circumference; and the great and gifted Linneus knelt down on first beholding Albion's beautifully blossomed furze!—but what a train of exalted associations are kindled by the peaceful grandeur and lofty majesty of the *Palo de Vaca!* Fountain trees, whistling trees, and canon-ball trees, all must wane before the "Palo de Vaca."

Humboldt describes the "Palo de Vaca," or "Cow Tree," as growing on the shores of the Cordilleras, and found most plentifully between Barbula and the lake of Maracaybo:—"On the barren flank of a rock," says this interesting writer, "grows a tree with dry and leather-like leaves; its large, woody roots can scarcely penetrate into the stony soil. For several months in the year not a single shower moistens its foliage. Its branches appear dead and dried; yet as soon as the trunk is pierced, there flows from it a sweet and nourishing milk. It is at sun rise this vegetable fountain is most abundant. The natives are then to be seen hastening from all quarters, furnished with large bowls, to receive the milk, which grows yellow and thickens at the surface. Some employ their bowls under the tree, while others carry home the juice for their children. This fine tree rises like the broad leafed star apple. Its oblong and pointed leaves, tough and alternate, are marked by lateral ribs: some of them are ten inches long. We did not see the flower. The fruit is somewhat fleshy, and contains a nut,—sometimes two. The milk, obtained by incisions made in the trunk, is glutinous, tolerably thick, free from all acrimony, and of an agreeable and balmy smell. It was offered to us in the shell of the tutuno or calabash tree. We drank a considerable quantity of it in the evening, before we went to bed, and very early in the morning, without

experiencing the slightest injurious effects. The viscosity of the milk alone renders it somewhat disagreeable. The negroes and free labourers drink it, dipping into it their maize or cassava bread."

This enterprizing traveller thus continues:—"Among the many curious phenomena which presented themselves to me in the course of my travels, I confess there were few by which my imagination was more powerfully affected than the Cow Tree. All that relates to milk and the cereal plants, inspires us with an interest, which is not merely that of the physical knowledge of things, but which connects itself with another order of ideas and feelings. We can hardly imagine how the human species could exist without farinaceous substances, and without the nutritious fluid which the breast of the mother contains, and is appropriated to the condition of the feeble infant. The amylaceous matter of the cereal plants, the object of religious veneration among so many antient and modern nations, is distributed in the seed, and deposited in the root of vegetables; while the milk we use as food, appears exclusively the product of animal organization. Such are the impressions we receive in early childhood, and such is the source of astonishment with which we are seized on first seeing the Cow Tree. Magnificent forests, majestic rivers, and lofty mountains, clad in perennial snows, are not the objects which we here admire. A few drops of a vegetable fluid impresses us with an idea of the power and fecundity of nature."

Connected with this extraordinary phenomenon, I shall now quote from a communication on the subject from Trinidad, addressed by Mr. D. Lochhart, to A. B. Lambert, Esq., one of the Vice-presidents of the Linnean Society:—"I have just returned from an excursion to the Caracas, where I collected the juice of a Cow Tree, and I have now the pleasure of sending you a phial of the milk, together with a few leaves and a portion of the root of the tree. The *Palo de Vaca* is a tree of large dimensions. The one that I procured the juice from, had a trunk seven feet in diameter, and it was one hundred feet from the root to the first branch. The milk was obtained by making a spiral incision into the bark. Carauo, the place where I met with the tree, is about fifty miles east of La Guayra, and at an elevation of from 1000 to 1200 feet above the level of the sea. It is likewise found between Cape Codera and Barcelona. The milk is used by the inhabitants wherever it is known. I drank a pint of it without experiencing the least inconvenience; in taste, and consistence, it much resembled sweet cream, and possesses an agreeable smell. I was so fortunate as to procure some young trees and roots, of the Palo de Vaca, which I will endeavour to increase." I have not heard with what success the attempt was attended,

but judging from the very peculiar circumstances under which the Palo de Vaca is found, I do not anticipate success from their transplantation and transfer. To the preceding communication, Mr. David Don, an excellent Botanist, and the librarian to the 'Linnean Society,' has added some observations. "I had an opportunity," says he "of examining attentively the leaves of the 'Palo de Vaca' and found them to approach very close to to those of several South American species of *ficus*. The disposition of the nerves and veins was precisely similar,which together with the insertion and consistence of the leaves themselves, appear to justify the propriety of the place assigned to the 'Palo de Vaca,' by M. Kunth, who has arranged it in the family of *Urticeæ*, under the name of *Galactodendron utile;* but neither he nor myself have seen the fruit or flower; so that as a genus, it rests on very insufficient grounds. The tree, however, is evidently related to *ficus* or *brossimum*. The juice contained in the phial sent to Mr. Lambert, had the appearance of cream, and, notwithstanding that it had suffered materially from the long voyage, the taste was by no means unpallatable." Though in the preceding note, Mr. Don confesses that neither he nor Kunth had seen flower or fruit, the *Cow Tree* is unceremoniously assigned to the family of the Nettles; so much for the 'NATURAL ARRANGEMENT,' as it is called, of Plants! and the dogmatism of its advocates.

Mr. Smith in a communication to Professor Jameson, mentions a tree discovered by him in an excursion up the river Demerara, possessing qualities somewhat allied to those of the Palo de vaca. It is stated to be a tree from thirty to forty feet high, with a diameter at the base of nearly eighteen inches; the milky juice which exudes very abundantly on the tree being cut, was found to be thicker and richer than Cow's milk, altogether without acrimonious properties, and mixing freely with water. It does not however seem to belong to the same genus of plants as the Cow-tree. Mr. Arnot examined a dried specimen transmitted by Mr. Smith, and proposes to call it *Tabernamontana utilis*. Mr. Fanning who came from the Caracas to England in 1827, brought home small specimens of the Cow-tree, the first ever seen in England, together, with a drawing of the tree, and brought with him at the same time some of the milk dried in the form of Lozenges. These plants all unfortunately perished.

I was through the kindness of M. A. de Jussieu, permitted to visit the *serres* in the 'Jardin des Plantes,' at Paris. Among the Genus *ficus*, are several fine specimens, as that of Madagascar, with leaves *three feet* long, the *ficus macrophylla, &c.* There is also one of the PALO DE VACA, which is there recognized under the name of FICUS BRAZILIENSIS, but certainly with questionable propriety.

There are some curious Phenomena connected with the genus *ficus*. The aërial roots detached from the outspreading branches of the *ficus religiosa*, that become to many additional props or pillars of support, is a conspicuous example. The 'Bannian' of the Nerbuddah with its 'alcoves and pillar'd shades,' is itself a forest and a family tree, that comprises a circumference of 2,000 feet round the extremities of the overhanging branches. Dr. Wallick mentions a specimen of the Bannian which has literally turned itself outside in like a glove, and another that from decay in one of its arms, being ready to give way, "strengthened its stakes" by projecting across a transverse young shoot.

Colonel Todd gives an example of a Teak-wood flag staff, embraced about "half mast high" by the 'Bannian,' with its roots dangling in the air, and having no communication whatever with the earth, and I have seen a specimen of the *ficus australis* that had been removed from the pot and attached to the roof of one of the hot-houses in the royal Botanic Garden of Edinburgh, for three years, and had already carried a crop of figs, I have also witnessed a *ficus elastica* growing entirely in the atmosphere.

There seems to be a 'milk-tree' among the Forests of Para, it is called 'massenodendron,' and is a lofty tree. An officer on board H. M's. ship 'Chanticleer,' informed me that this milk was commonly used on board for a considerable time, and found to equal Cow's milk in every respect, it underwent no chemical change, nor did it cast up any cream, neither was there any tendency to acidity, nor did alkalis affect it; after nine days it became more transparent towards the top, and eventually precipitated a whitish, curdy substance, having, (when the liquid was evaporated), somewhat of the nature and properties of vegetable wax. He further stated that the fruit, which contains two seeds, tasted precisely like *strawberries and cream*, and the wood was employed as timber in shipbuilding in the dock yard at Para.

Sir R. K. Porter has had the goodness to send me from the Caracas, a bottle of the milk of the Palo de Vaca, together with the portion of a branch, containing three leaves from an *old* tree, and a branch with its leaves, of a *young* tree with a piece of the bark, and enhanced the truly valuable donation, by a beautiful sketch of the tree itself, highly characteristic of his elegant pencil. I cannot resist the pleasure of giving entire the graphic description of his visit to the Palo de Vaca, as contained in his very interesting letter to me, under date, 8 June last.

"The period at which my visit was made to this marvellous vegetable production, unfortunately found it without flower or fruit, but as I have in vain for months and months past endeavoured to ascertain the parti-

cular time of either or both; I was compelled to seize the first leisure four or five days, to make an excursion into the mountainous part of the country where it grows.

"We journeyed over a most rugged suite of mountains to the Cordillera on the north coast, which occupies nearly its whole extent, and at a distance of 50 miles from this capital, at an elevation, I should suppose of between 4 and 5,000 feet above the level of the Carribean sea; reached the neighbourhood of the tree sought for, having passed the night at a sugar estate, in one of the pretty and productive vallies, abounding near the coast. At six the following morning, attended by some natives, we began an ascent of about a league up the face of an awfully steep mountain, covered with a dense forest of enormous trees and thick jungle. The people were actually obliged to cut a pathway through the almost impenetrable hanging branches, and other bushy interruptions. After a most toiling walk, in a couple of hours, we reached the *Palo de Vaca* Grove, and I assure you I felt most amply repaid by the sight of so many marvellously huge vegetable productions, for all the fatigue I had already undergone. The tree our people first commenced their milking operations on, measured somewhat more than 20 feet in circumference, about a man's height from its roots; from whence its magnificently collossal stem rose to full 60ft., clear of the smallest branch or leaf. The vast arms and minor branches spread themselves at this elevation on every side, certainly, to an extent from the centre of at least 25 feet; the whole luxuriantly clothed with immense leaves. This splendid portion of the tree I am sure cannot add less than 40 additional feet to its wonderful elevation.

"The Indians of our company told us that the milk is far more profuse in its flowing when the requisite incisions are made in the bark on the increase of the moon, than it is on the decrease; however, we got a couple of bottles of it in a quarter of an hour, but from two trees. When the wound was made in that on which I looked with so much wonder and *indescribable feeling*, the snowy current broke forth with great violence. Its colour and consistency were precisely that of the animal milk, with a taste not less sweet and palatable; yet it left on the tongue a slight bitterness, and on the lips a considerable clamminess; an aromatic smell was most strongly perceptible when tasting it. I have sent you a small piece of the bark, in which is contained the lacteal fluid. It varies from an inch to one and a half in thickness. The wood forming the body of the tree is white, hard, and close grained. The dimensions I have given were exceeded by many feet in every way by numbers of others of the same that grew within some yards

around. The forest abounds in thousands of different kinds of trees, many even exceeding in size, the wonderful ' Palo de Vaca !' "

The dimensions of three leaves sent me by Sir Robert Ker Porter, and taken from an old Cow Tree in the mountain forests near Caracas, in Venezuella, on the 23rd May, 1837, I find respectively to be $14\frac{3}{4}$ in. long, by $4\frac{1}{2}$in. in breadth, at the middle of the leaf; $14\frac{1}{2}$in. long, by $4\frac{3}{4}$in. in breadth; and $13\frac{3}{4}$in. long, by $4\frac{1}{2}$in. broad. Sir Robert observes "with regard to the *living colour* of the leaves, it differs little in depth of green and polish, from those of the laurel leaf."

In the leaves of the veteran Cow Tree the other proportions were as follows:—Curved tip $1\frac{1}{2}$in. long, fringe $\frac{1}{8}$in. broad, the ribs, or main lateral veins, greatest $\frac{3}{4}$in., and least $\frac{3}{8}$in.; there is a distance of 3in. between the lower leaves on the stem.

Six leaves of a *young* ' Palo de Vaca' tree were sent at the same time with the others; three were still attached to the stem, and the other three separate. The leaves are alternate, with a prolongation of the mid rib, at the summit somewhat curved, and similar to that of the "Bannian" leaf. Length of the petiolus or leaf stalk, $1\frac{1}{8}$in. Space between the two upper leaves on one side, $2\frac{1}{2}$ inches.

Lower leaf on the stem, 9 inches long and $2\frac{1}{2}$ inches broad.				
Central one, ..	$8\frac{1}{2}$	ditto	$2\frac{1}{2}$	ditto.
Upper leaf, ..	10	ditto	$2\frac{3}{4}$	ditto.

Curved tip at the summit, $\frac{1}{2}$ inch long.

I have compared with some degree of attention the vascular structure of the ' Palo de Vaca,' with skeleton leaves of several exotic species of the genus *ficus*. The elongated and curved tip of the leaf and the narrow reticular fringe in the foliage of the *ficus religiosa*, have some affinity with similar parts of the leaves of the ' Palo de Vaca,' but here the similarity ends. The contour or general form of the leaf more nearly approaches that of the *ficus elastica*; but in this last, the curved extension at the summit is wanting, and the beautiful parallelism of the lateral fibres does not find a counterpart in those of the ' Palo de Vaca,' which somewhat exemplify the structure of the *forked* veins. The *similitude* of the leaves of the most magnificent in the *beautiful* of vegetation, and the noblest monument of the *useful* among her myriad wonders, is not less striking than extraordinary. I have compared the leaves of the ' Palo de Vaca', with those in the splendid engraving of the *Amhertia nobilis*;—the LARGEST SIZE, (of which I believe only *four* were finished, and one of these is in my possession), wherein the leaves, &c., are represented of their natural

magnitude, and find that the size, contour, veining, and nervures, &c., exactly correspond.

Decandole, in his "Considérations sur la Phytologie" observes, "Des tous les moyens de perfectioner la Botanique proprement dite, le plus fécond est la multiplication des monographies de genres ou de familles."* But the 'Palo de Vaca,' seems to be so insulated by its peculiarities from its fellows, as to merit a separate memoir. There seems to be no *natural* alliance with the *Urticeæ*, into which 'family' it has been forced along with the 'artocarpus' or 'Bread-fruit,' and the 'Jaca;' while the chemical constitution of its peculiar lactescent secretion separates it from *ficus elastica*, and its congeners yielding *India Rubber*. Besides, we have no data to determine with sufficient accuracy its *genus*, which after all may be *sui generis* and have no proper affinity with *ficus* or *brossimum*.

The milk when allowed to repose for several months *per se*, throws up no superficial film resembling the *cream* of animal milk, but separates naturally into a solid mass of a somewhat granular consistency, and a coloured liquid comparatively fractional in quantity.

The aqueous solution of the 'milk' of the 'Palo de Vaca' after some time, deposits a white sedimentary powder, somewhat resembling *pearl white*, and this adheres also to the sides of the phial.

The aqueous solution agitated in contact with highly rectified sulphuric ether, after a lapse of several months, separated into four distinct strata or layers, namely, an aqueous stratum at the bottom, on which was superimposed a dingy opake coagulum; a white curdy zone remained floating on it, and above a clear liquid like sulphuric ether. When after a lapse of several months, the contents of this phial were poured into a wine glass, and allowed gradually to evaporate, the thin incrustation which floated on the top, and somewhat resembled that of camphor when separated by water from its solution in alcohol was gradually precipitated; when pressed between the fingers it was viscid and sticky, and what had become concrete on the lip of the phial, resembled birdlime in a dried state.

The following experiments were instituted on a portion of the 'milk' of the Palo de Vaca, previously transmitted to me by Sir Robert Ker Porter, and received on the 6th February, 1837; the milk being extracted in October preceding.

When the cork of the bottle was withdrawn, it was followed by an explosive report, almost as loud as that of a pistol; succeeded by a violent effervescence and overflow of the lactescent liquid, accompanied by a copi-

* "C'est dans les monographies seules," says he elsewhere, "que reside l'avancement de la botanique descriptive."

ous disengagement of carbonic acid gas, in a visible form, resembling light smoke from its combination with aqueous vapour.

The consistence, taste, and smell were precisely that of thick sour cream, with curdy granulations deposited on the surface in contact, and it felt somewhat viscid or clammy to the touch. I used a little of it in *tea*, and it relished very well, and imperfectly mixed like sour cream, imparting a curdled appearance, and tasting somewhat balsamic.

Carbonic acid gas was freely disengaged in a *nascent* form, and rendered *lime-water* turbid.

When mixed with *caustic potassa*, granulations were formed.

Perchloride of iron was not notably affected, but when *chloride of gold* was applied, being preceded by *caustic potassa*, it became BLACK, hence *morphia* was inferred to be be in combination.

Perchloride of mercury precipitated a fine white arenaceous matter, indicating *albumen*.

It presented no *oleaginous* appearance on the surface of boiling water.

Blue litmus paper was changed permanently *red*, not altered by a considerable temperature.

It separates from distilled water when suffered to repose, and minute arenaceous granulations adhere to the sides of the phial.

When mixed with *distilled water*, and shaken in contact with *sulphuric ether*, the latter soon parts and floats transparent on the surface, and in the centre, a whitish turbid stratum or band, makes its appearance.

With *hydrochloric acid*, it became *turbid* and *granular*.

Nitric acid produced a *curdy* appearance having a *sulphur yellow* colour.

The application of *sulphuric acid* produced a *dark coagulum*.

When heated to 176° F., *flakes* and *flocculi* of *albumen* were announced.

Mixed with *alkohol*, it readily passed in perfect transparency through the filter, and *distilled water* rendered it *milky* from the presence of *resin*.

A slip of card stained with *tincture of iodine*, became *blue* from the milk when previously heated.

It temporarily mixes readily with distilled water, and when boiled, separates into curdy matter, which collects at top; and a clear liquid passes through the filter.

With the addition of *protoacetate of lead* no notable effect was produced, hence the absence of *mucus*.

Silicated Potassa rendered it *brown*, and separated turbid flocculi, apparantly *gum*.

Boiling alcohol gave indications of *wax*.

It is evident that the milk had undergone fermentation and decomposition from the long voyage, and it is *possible*, that when it first flows from the tree, CAOUTCHOUC may obtain in it, being subsequently partially decomposed or modified by the fermentation which had supervened, but no trace of genuine caoutchouc, as commonly recognized, could be detected.

Trail has stated, I know not on what authority, that the milk of the Cow Tree contains a considerable quantity of *caoutchouc*; this, however, does not seem to be the case. The product partially soluble in ether, &c., and having a very nauseous smell, seems to be a substance intermediate between *bird-lime* and *gluten*, or perhaps a combination of both. Some milk from the Caracas, mentioned by Trail, remained sweet for six months, and according to him, yielded *little or no caoutchouc*, but afforded both *wax* and *resin*.

I infer from the chemical examination of this VEGETABLE MILK, as indicated by these several reagents or tests, the presence of

ALBUMEN.

GUM. } perhaps associated in the form of a *gum-resin*.
RESIN. }

WAX.

MORPHIA, a *minute* quantity.

FECULA, in *small* proportion.

A substance combining the properties of BIRD-LIME with those of the GLUTEN of wheat, &c.

CARBONIC ACID, ACETIC, and perhaps other acids.

The separated white curdy flakes left on evaporation of the solution in ether, were not materially changed by continued exposure to bright sunshine. This matter was extremely viscid and sticky, so as to require some effort to separate the fingers, or slips of paper glued together by it. Soap and water had no effect in removing it from the skin, which could only be accomplished by the previous application of alcohol. I infer therefore, from its peculiar characteristics, that it is BIRD-LIME, and neither *caoutchouc* nor *gluten*, at least, in their usually recognized characters, though *bird-lime* seems to be something intermediate or perhaps rather a modification of both.

A portion of distilled water at 212° was poured on the bark in powder, which imparted to it a greenish yellow colour.

Percloride of mercury precipitated a reddish arenaceous powder.

Persulphate of iron produced a dark purplish tint.

Tincture of iodine yielded an immediate dark violet, and eventually precipitated a 'black-blue' sediment.

Alcohol afforded a slight indication of gum.

Solution of isinglass gave a brown tannate of gelatine.

Infusion of galls, a slight turbid brownish precipitate.

Litmus paper was not notably affected.

Nitric acid imparted a brownish and 'greasy' appearance.

Caustic potassa gave a dark brown tint.

The fibres of the inner bark are possessed of considerable tenacity and strength. To the taste, the bark of the Cow Tree evinces no perceptible acidity, and only a weak astringency.—A strip of the EDIBLE NEST of the 'Java Swallow' having been preserved for sometime in a decoction of the bark, was converted into a substance resembling LEATHER, dark, and fibrous in structure, so that this epicurean dainty is an organized animal substance, having the character of *Gelatine*.

On combustion, the external cortical matter yielded a feeble indication of the presence of *Nitrate of Potassa*, especially determinate in the *liber*, which afforded frequent scintillations or deflagrations. The external bark is somewhat warted, and in the interior, is of a reddish yellow colour. The liber is fibrous and tears like coarse brown paper.

Cold rectified alcohol was added to another portion of the powdered bark, and received from it a tint similar to that imparted to the boiling water.

Tincture of iodine was entirely unaffected.

Persulphate of iron communicated a claret tinge.

Perchloride of mercury gave a bright red arenaceous sediment.

Distilled water produced indications of resin.

Solution of isinglass formed a brown powder and precipitate.

Infusion of galls, precipitated a red powder.

Litmus paper was slightly reddened, evincing the presence of a weak acid.

Nitric acid communicated a darker shade.

Caustic potassa produced a dark brown colour.

The various reagents adverted to, combined with others, afforded in-

dications of gallic acid; tannin, gum, resin, fecula, gluten, extractive, and colouring matter. I contemplate at some favorable opportunity a more extensive and more minute series of experiments, both on the "milk" and bark, in a quantitative analysis, but those already mentioned, shew that both of them are fraught with phœnomena of no common interest.

Among the various secretions belonging to vegetation, which I have made the subjects of particular chemical examination, there are none, with the exception of the milk of the Cow Tree, which have imparted a deeper interest than those of the 'Coryanthes maculata' and the liquid contents of the ascidium of the 'Nepenthes distillatoria' or Pitcher Plant, and the kindness of Earl Fitzwilliam has enabled me to do both. The 'Coryanthes maculata' is a native of the Brazils, and belongs to that extraordinary class of Plants recognized under the name of *Epiphytes*. In sombre or gloomy weather the flowers refuse to open, and the singularly curious blossom contains two glands, sufficiently conspicuous, from which a secreted liquid, perfectly limpid and colourless, is incessantly distilling day and night for two or three days continually, from the tips of the glands into the pouch of the *labellum*, whence as soon as it reaches a certain level, the superfluity is drained off by ducts provided for this purpose. A portion of this liquid, which to the taste, precisely resembled OPIUM, was submited to specific tests, in order to determine its peculiar nature. It was unaffected by sulphate of iron, nitrate of Baryta, lime water and oxalate of ammonia. Litmus paper was slightly *reddened*, hence the presence of a *supersalt* was inferred. A drop of pure potassa, followed by chloride of gold, became *jet black*, this with the permuriate of iron *becoming red*, proved unequivocally the existence of MORPHIA. A crystal of nitrate of silver became slightly opake at the edge. It seems evident therefore that this liquid contains *morphia* in the form of supersalt, perhaps the *supermeconate of morphia*, accompanied by a little *narcotine*. It is a matter of some difficulty to discover the use or purpose for which this singular provision was intended, and conjecture is all that can be ventured upon. It may maintain an equable temperature and thus tend to preserve the flower, or it may be intended to prevent insect depredation, or subdue the irritability of the organs of fructification—or finally become a subtile medium and vehicle of absorption for the pollen.

The chemical examination of the liquid contents abstracted from two ascidia of the Nepenthes distillatoria, one of which had not as yet opened the lid of the pitcher, and the other had opened some hours before, supplied me with the following phenomena.

In the *former* of these, litmus paper was instantly *reddened*, remaining permanent.—Other test papers as those of Turmeric and Brazil were not affected. Nitrate of silver evinced a *curdy appearance*, which became subsequently *brown*. Oxalate of ammonia produced an effect somewhat equivocal. Silicated potassa, phosphate of soda, hydriodate of potassa, and nitrate of baryta produced no sensible effect whatever.—Others gave me the presence of *Saccharine* matter, but *lime water* gave no index of change, nor was Chloride of Platinum sensibly affected, I am therefore warranted, contrary to the opinion of that able chemist, the late Dr. Turner, to infer the entire absence of 'superoxalate of potassa,' and consider the liquid contents of the pitcher to contain *malic acid, lime (?), muriate of soda* and a little *saccharine* matter. The *brown* tint indicated by the test of Nitrate of Silver, I conclude was owing to *Chlorophyle*; and the presence of malic acid I infer rather from the peculiar smell develloped when the liquid is heated than draw my conclusions from any specific reagent. When the contents of the pitcher are long exposed to the contact of the atmosphere, it is quite conceivable that the reaction of the uncombined acid (mallic) on the Saccharine matter may promote its transmutation into *oxalic acid.*

The liquid obtained from the pitcher that had already been opened, was of an amber colour and pleasantly acidulous. The following reagents were perfectly inert, namely, nitrate of baryta, silicated potassa, lime water, oxalate of ammonia, and perchloride of platinum.

Litmus paper became permanently red,—subacetate of lead formed a *greyish precipitate*, nitrate of silver yielded curdy flocculi, afterwards brown; with caustic potassa it became turbid, and develloped *ammonia.* This last, I consider, was owing to the insect life destroyed in the liquid, after the lid of the pitcher opened, portions of which indeed could be detected in the fluid. Mallic acid, (perhaps too mingled with other vegetable acids), muriate of soda and chlorophyle were the contents. In this case as in the other, there was no trace of oxalic acid either free or combined.

The structure and mechanism of the pitcher is altogether of the most curious and interesting kind, and that the liquid is the secretion of the plant is evident; because it is found there, when the lid of the pitcher is as it were hermetically closed, and is altogether impervious to air and moisture. The mid rib of the leaf where it enters into the reservoir of the pitcher is hollow, and the lower interior surface, to the extent of two-thirds its depth, is finely varnished and studded all over with minute orifices, pointing downwards. These I believe to be the mouths or *stomata* of the secreting organs that replenish the pitcher, and I am led to this conclusion from the inclination of the orifices, as well as from having seen very small

ants in such ascidia as had already opened their lids, adhering to them, and having also observed with a lens, minute globules in contact with these orifices. The structure of the pitcher is very singular and completely interwoven with spiral coils, such as are observable in the leaf stalk of elder leaves; also in those of the dog-wood, and especially the petiolus of the blue lotus, *(nelumbium cerulœum.)* If the ascidium be gently rent assunder, every part will be found full of them, and the tissue appears like that of a gossamer web. The lip is composed of a spiral coil, or rather circinate folds, separated at the hinge and broader towards the centre in front, which acts as the fulcrum to the lid, and is more opake than the body of the pitcher. In the progress of maturity, the folds devellope themselves, and the ends pressing on the hinge of the lid cause it to open, *first at each side*, for by a curious process, being a prolongation of the ribs in front; the lid is there strapped down, and maintained in that position for sometime longer. Air will thus find access laterally, while *dilution* from atmospheric vapour will be prevented. The liquid will thus become acidulous or acidified, and Dr. Graham has remarked that the liquid, subacid in the first instance, became ultimately more distinctly acid. It appears to me that the liquid matter poured into the pitcher by the secreting orifices which stud the inner surface, flows into the plant again by the hollow canal of the mid rib, having been previously subjected to the electro-chemical action of the sunbeam, and thus completes the conditions of circulation; and the pitcher having fulfilled the office for which it was destined in the physiology of the plant, throws open the lid, declines from the perpendicular and pours its residual contents on the ground.

It is very interesting to consider the varied character of *lactescent* Juices in the vegetable kingdom. That of *euphorbias* is highly acrimonious; that of the poppy and lettuce, narcotic; that of *Ficus elastica, &c.* very elastic, and in the lactodendron utile, and Palo de Vaca, bland and nutritive.

The milky juice of the *assafœtida* concretes into a fœtid gum, and that of the 'Jaca' *(artocarpus integrifolia)* is a *bird-lime.*

The *urceola elastica* of palo penang, creeps on the ground or climbs the loftiest trees, extending frequently more than 500 feet. The lactescent juice which flows when the stem is wounded in an old plant, has been computed to amount to two-thirds the entire weight of the plant. It constitutes when consolidated, *caoutchouc.*

From two fine branches of *Kolquall* (euphorbia antiquorum), at the mountain Taranta, in Abysinnia, wounded by a sabre, according to Bruce, there poured forth a stream of milky fluid of nearly four gallons, and so

caustic as to excoriate the fingers like boiling water, and to stain with an indelible rust the blade of the sabre.

I have a specimen of the indurated albumen of the double cocoa nut, or 'coco de mer', which has been preserved for upwards of twenty years, it is as hard and capable of receiving as fine a polish as ivory; it has been cut and I have a beautiful model of the 'coco de mer' carved from a portion.

The 'Palo de Vaca' whether considered in reference to its 'MILK', or rather *cream*, or its BARK, affords phœnomena among the most remarkable of the wonders of vegetation. Both the 'milk' and bark contain the elements of nutritious and wholesome food for man, and BREAD formed of its bark would be almost equal to the *cerealia*, or that made from corn,—"the finest of the wheat;"—for the immediate or proximate parts of wheaten flour* are found in the bark of the *Cow Tree*—so that the "Palo de Vaca" yields both BREAD and MILK.

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* The predominant quantity of *Gluten* in wheat, distinguishes it above all the other farinaceous grains.

FINIS.

PRINTED BY T. H. SKELTON, SOUTHAMPTON.